

Premium Coatings

for your Precision Tools



Electromobility, Communication, Medical Technology Develop your Business in these Markets with CemeCon Coating Technologies.

Machinists demand application-specific solutions for high productivity and first-class results in these markets.

With our HiPIMS and diamond coating technologies, we offer you the leading technologies on the market and the largest selection of premium coating materials. We will put you in the best position to lead your competitors in these new markets.



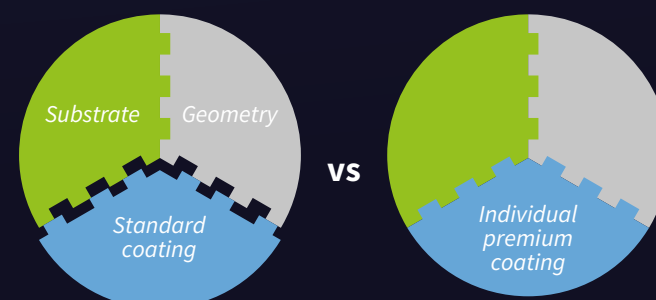
50 % of a perfect coating

... is the choice of the right coating material. With CemeCon Engineering, we tailor the other 50 % to premium coating!



High-performance coating materials are the precondition for first-class coatings.

Your precision tool with its individual form, function and objectives is our focus. During the development phase of your tool, our coating experts work together with you, because a successful precision tool is the result of an optimal substrate, elaborated geometry and the best individual premium coating.



Unrivalled Products through CemeCon Engineering We fit your Individual Coating perfectly to your Precision Tool.

35 years of coating know-how enable us to produce perfect products from outstanding cutting tools. We open up completely new levels of performance in machining and thus also particularly attractive sales markets.

Your individual premium coating in 2 steps:

1. **selection of the suitable coating process and assembly of the appropriate coating material specification** for your precision tool. Adapted to the machining task, specified application parameters and other technical and commercial objectives for your precision tool, we will compose your premium coating from a wide range of options. This includes, for example, the pre- and post-treatment, the coating thickness, final dimension with measurement report, tolerances, colors, packaging, delivery time and much more.
2. you supply us with **your test tools, we coat them with the best coating materials in the world**, then you test the quality of the tool in use.

Together we achieve the desired performance goals of your precision tool.

We are technology developers, equipment manufacturers, and coaters in one.

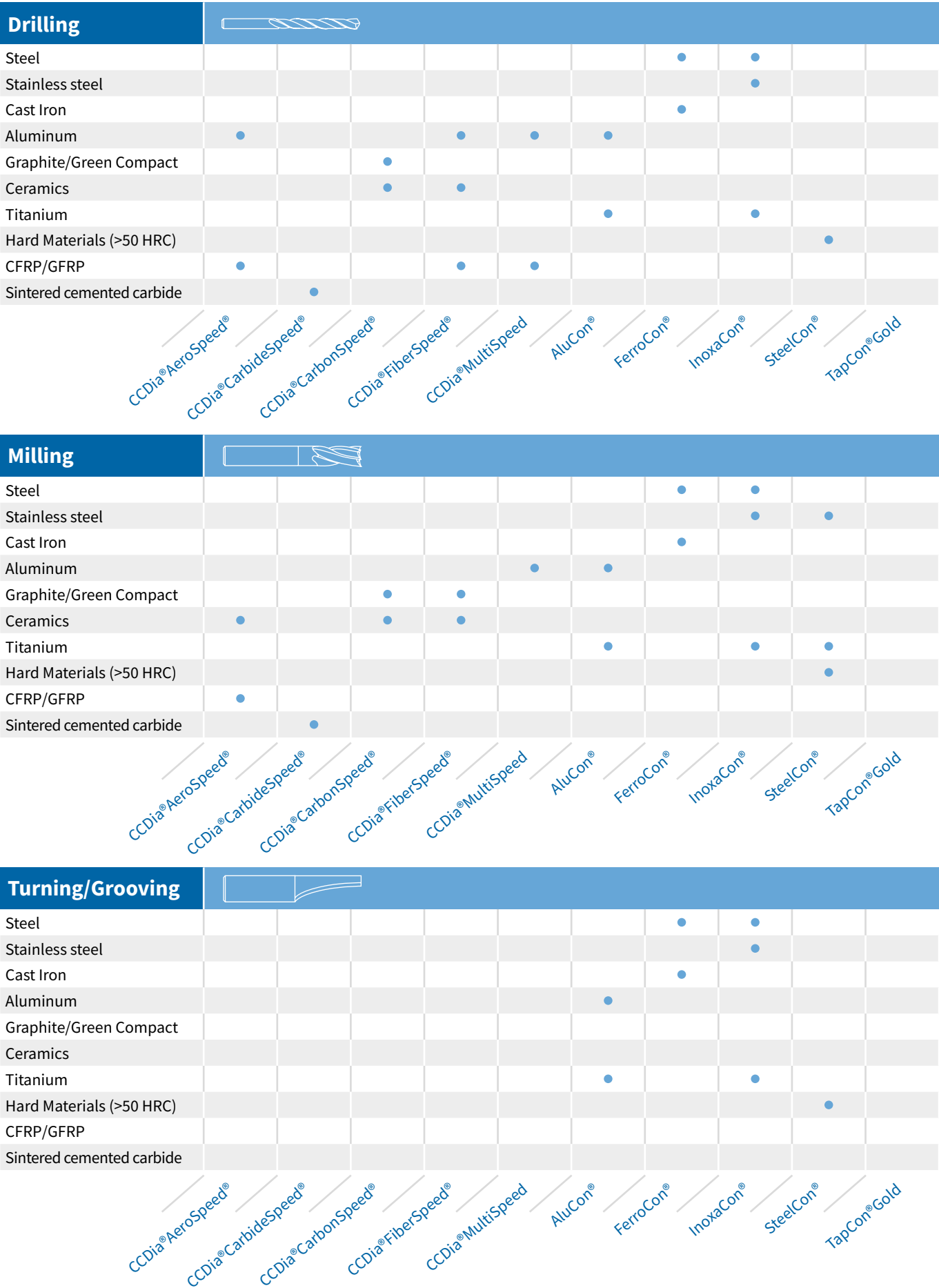
In the world's largest coating center, we coat up to 80,000 precision tools every day.

We use this wealth of experience to ensure that each tool is treated the optimal way. Strictly separated batches, individual production processes, and precise documentation ensure that your recipe for success is guaranteed at all times and all over the world with equally perfect results.

Our coating experts are just a click away:
coatingservice@cemecon.de



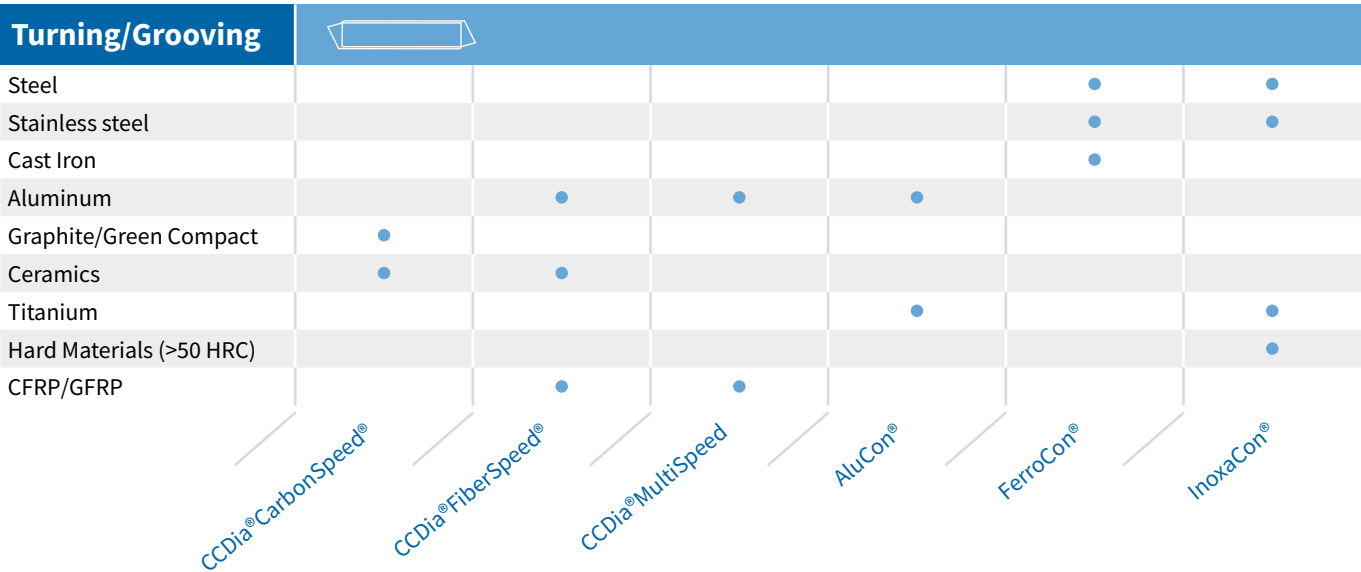
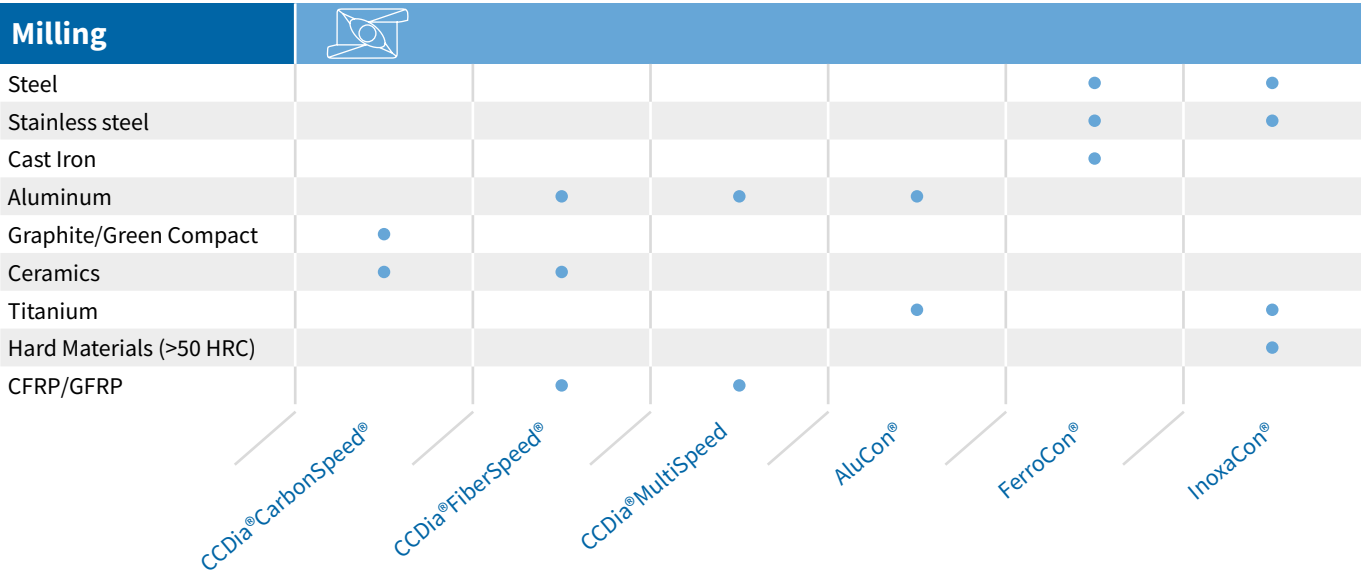
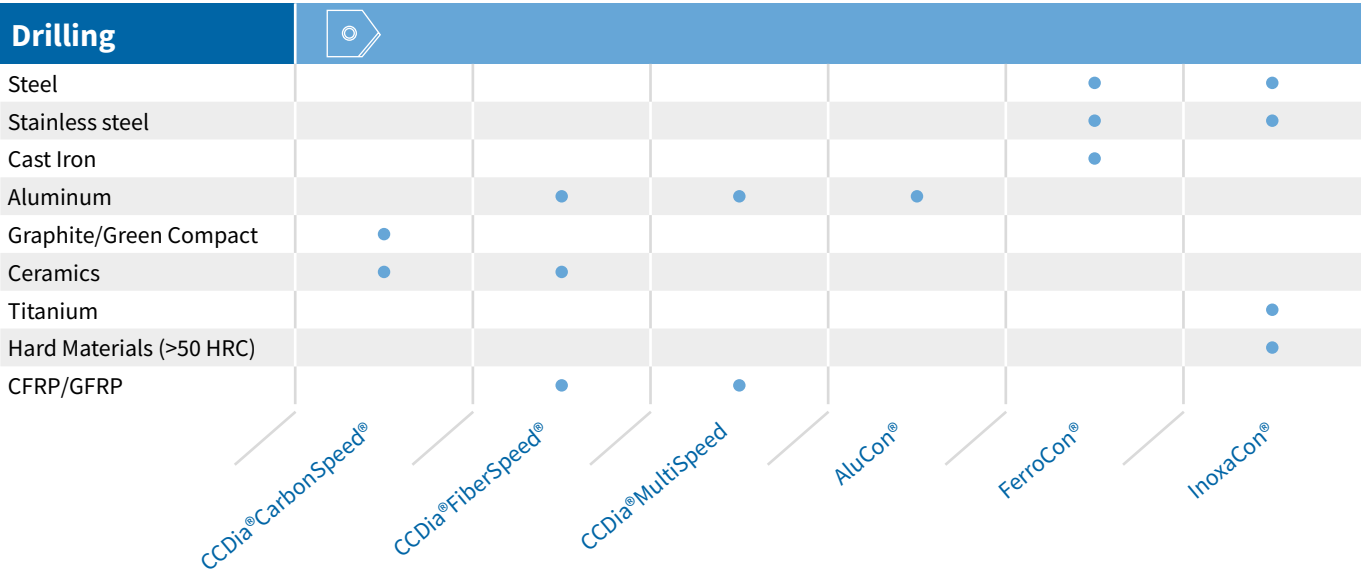
The Right Coating



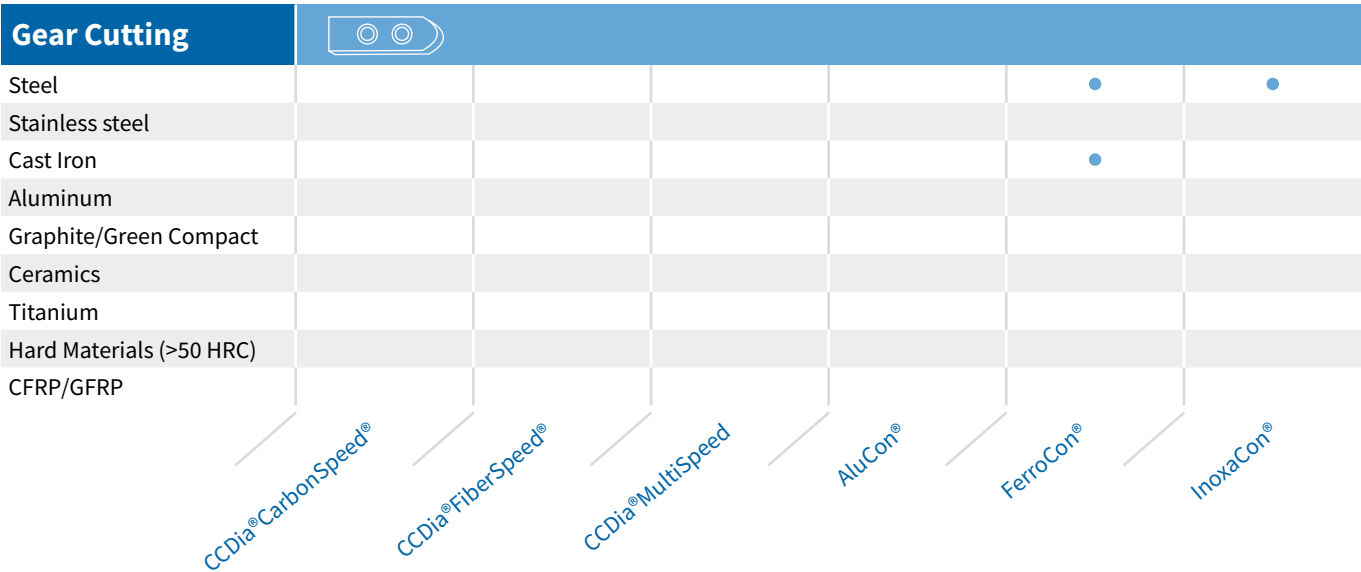
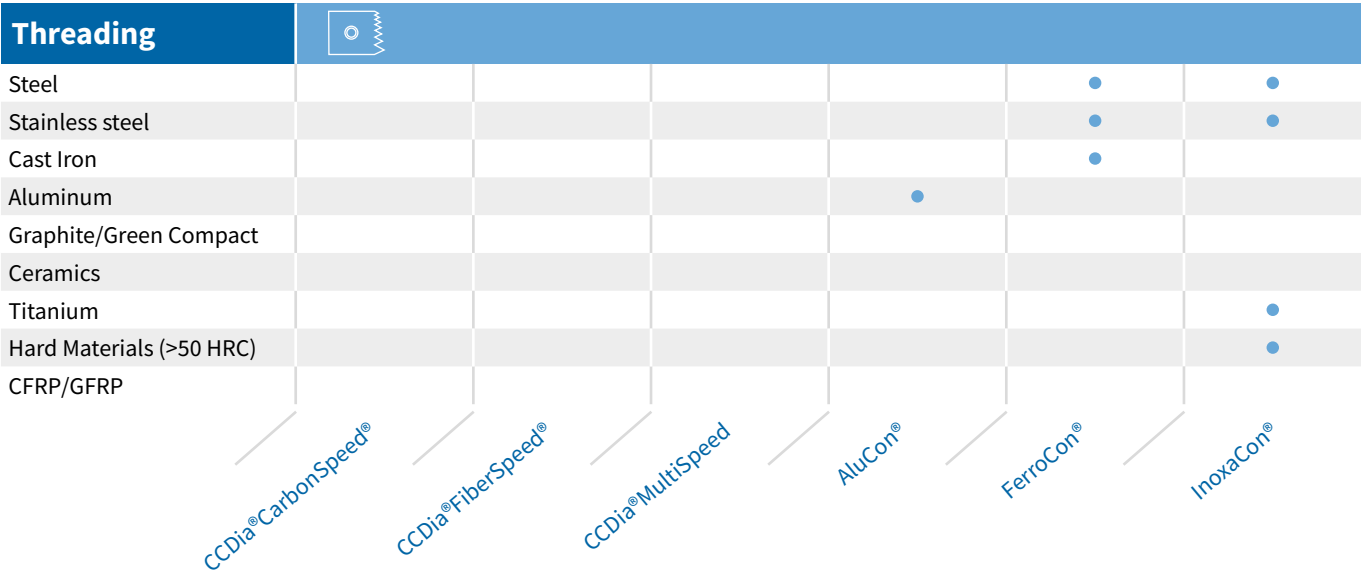
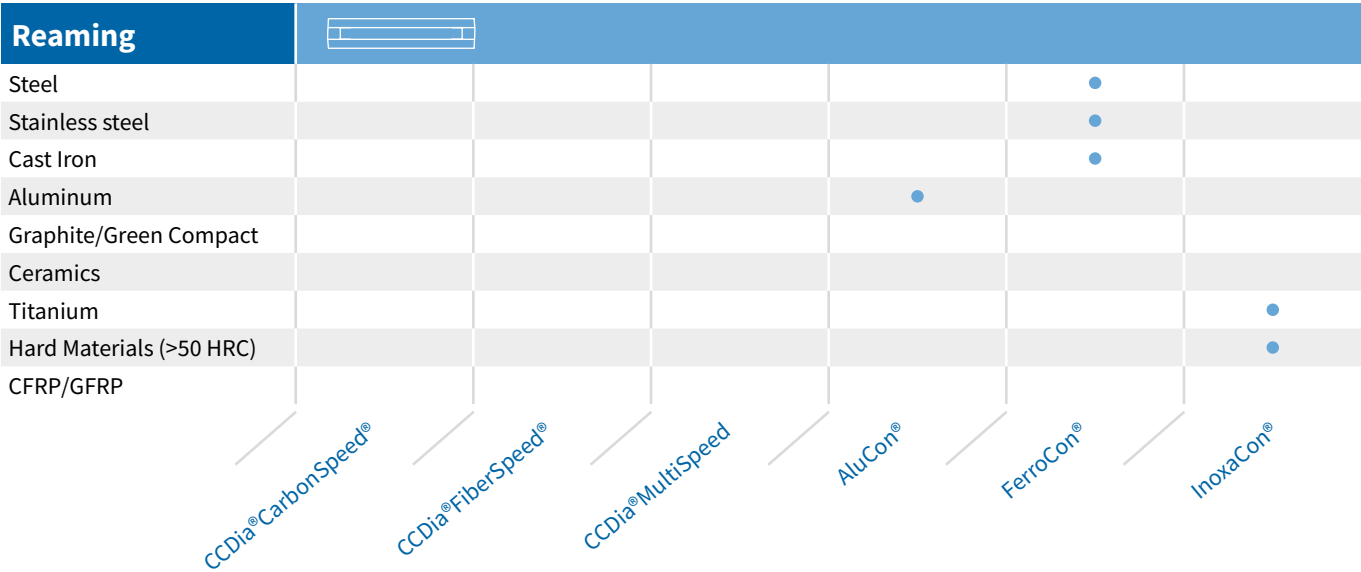
for Round Tools























































































The Right Coating



for Cutting Inserts



Characteristics of the Coating Materials

					Coating material	Layer thickness ≈ μm	Composition	Color
Diamond								
	CCDia®AeroSpeed®Thin				3	C		 
	CCDia®AeroSpeed®				9	C		 
	CCDia®AeroSpeed®Plus				14	C		 
	CCDia®AeroSpeed®Extra				17	C		 
	CCDia®CarbideSpeed®					C		 
	CCDia®CarbonSpeed®				7	C		  
	CCDia®CarbonSpeed®Plus				9	C		  
	CCDia®CarbonSpeed®Extra				12	C		  
	CCDia®FiberSpeed®				9	C		 
	CCDia®MultiSpeedThin				3	C		 
	CCDia®MultiSpeed				14	C		  
HiPIMS	AluCon®				2	TiB ₂ -based		   
	FerroCon®Thin				1.5	AlTiN-based		 
	FerroCon®				3	AlTiN-based		  
	FerroCon®Plus				4.5	AlTiN-based		 
	FerroCon®Plus				6	AlTiN-based		 
	FerroCon®Quadro				12	AlTiN-based		 
	InoxaCon®Thin				1.5	TiAlSiN-based		 
	InoxaCon®				3	TiAlSiN-based		   
	InoxaCon®Plus				6	TiAlN/TiSiN-based		 
	SteelCon®Thin				1.5	TiAlN/TiSiN-based		 
	SteelCon®				3	TiAlN/TiSiN-based		  
	TapCon®Gold				3	AlTiN-TiN-based		  

Diamond – the Hardest Material in the World

Cutting of Graphite, CFRP, GFRP, Composites, Abrasive Non-ferrous Metals and Ceramics with Patented Multilayers.

The patented CemeCon multilayer structure ensures maximum stability of the individual layers within the coatings. Due to their extremely high hardness – with up to 10,000 HV_{0.05} close to natural diamonds – all coatings of the product group CCDia® are extremely wear-resistant. The performance of shank tools and cutting inserts made of solid carbide is increased significantly with a CCDia®-coating. The high thermal conductivity of the diamond coating ensures rapid heat dissipation. This is important when

processing temperature sensitive materials like CFRP and GFRP and enable a higher machining speed during manufacturing.

All these properties make the coating materials of the CCDia®-series the first choice for machining of graphite, composites, non-ferrous metals, green parts, and ceramics according to VDI standard 3323.



The Advantages of our Diamond Coatings at a Glance

The Diamond Coatings from the CCDia®-series clearly stand out from other Solutions.

Excellent adhesion and very smooth surfaces

Coating

Cobalt Tungsten carbide Diamond

The patented CCDia®-multilayer-diamond-coatings have excellent adhesion because they are adapted to the carbide, geometry, and application. At the same time, they form very smooth surfaces.

Special material requirements – Best machining results

IDI Precision Machinery Ltd.

Due to their extreme hardness close to natural diamond, combined with high thermal conductivity, diamond-coated tools achieve long tool life and best machining results in high-tech materials.

High process reliability

Micro-Crystalline Diamond Coating

Nano-Crystalline Diamond Coating

CemeCon Multilayer Diamond Coating CCDia®

The crack-stopping properties of CCDia®-coatings ensure high process reliability in the machining process.

Wide range of coating thicknesses

From thin coatings to very thick diamond coatings, CCDia®-coatings are high-precision up to 20 µm coating thickness.

Precision is a matter of course

You would like to have your tools coated to a specific final diameter including a measurement report? Thanks to our hot filament process, complex three-dimensional tools receive a particularly homogeneous coating thickness distribution with narrow tolerances. We attach great value on precision.

World market leader for 25 years in diamond coating

The machining of demanding materials in dental and medical fields or the production of cell phone molds are not conceivable without diamond-coated tools. CemeCon is the pioneer of diamond coating for cutting tools and has offered its customers the advantages of this technology for more than 25 years.

Open for carbides

Approximately 100 carbide grades, including grades with a higher cobalt content of up to 10 %, are ideally suited for coating with CCDia®-coating materials.

CCDia®CarbideSpeed®

Milling Sintered Carbide instead of Eroding

Milling hard metals instead of eroding them or grinding has enormous advantages: shorter cycle times, better surface quality, more environmentally friendly machining, no corrosion, and the production of more complex contours. With the newly developed CCDia®CarbideSpeed®, we offer tool manufacturers a precisely matched diamond coating material which creates ideal conditions even for the hardest operating conditions.



CCDia®AeroSpeed®

for CFRP, GFRP, Composites

The Premium Diamond Coating CCDia®AeroSpeed® was developed in order to achieve the highest surface qualities with the machining of fiber materials. The excellent adhesion combined with the unique smoothness guarantee productive drilling and milling of CFK, GFK and composites. Additionally, the very sharp cutting edge enables a better separation of the fibers. CCDia®AeroSpeed® is also suitable for solid carbide grades with increased cobalt content. The increased toughness of these grades in combination with a diamond coating enables process-safe drilling in aircraft construction.



TECHNICAL DATA

Coating technology:
Diamond
 Microhardness:
10.000 HV_{0,05}
 Composition of the coating material:
Multilayer, sp³
 Color:
Grey-Shiny
 Max. operating temperature:
650 °C

APPLICATION EXAMPLE: A MILESTONE FOR TOOL AND MOLD MAKERS

Material:
Sintered Carbide, 20 % Co
 Tool:
Coated ball nose end mill
 n = **30,000 min/-1**
 v_f = **350 mm/min**
 a_p = **0.15 mm**
 a_e = **0.08 mm**
 Q = **0.0042 cm³/min**

454

CCDia®CarbideSpeed®

450

300

150

0

Tool life (mm³)

uncoated/
PVD coated
(machining operation not possible)

TECHNICAL DATA

Coating technology:
Diamond
 Microhardness:
10,000 HV_{0,05}
 Composition of the coating material:
Multilayer, sp³
 Color:
Grey-Shiny
 Max. operating temperature:
650 °C
 Available coating thicknesses:

≈ 3 µm (Thin)	•	•
≈ 9 µm	•	•
≈ 14 µm (Plus)	•	•
≈ 17 µm (Extra)	•	•

APPLICATION EXAMPLE: PERFECT SURFACE QUALITY THROUGHOUT THE ENTIRE TOOL LIFE

Material:
CFRP, IMA-M21E
 Tool:
Carbide countersink-drill
 d = **5.6 mm**
 d_{countersink} = **12.5 mm**
 f = **0.05 mm**
 n = **6000 min-1**

980

CCDia®AeroSpeed®

1000

800

600

400

200

100

uncoated

Tool life (number of holes)

CCDia®CarbonSpeed®

for Graphite and Green Materials

Ultra-hard against abrasion wear: CCDia®CarbonSpeed® is the coating solution when economical machining of graphite and green materials is required. Coatable on more than 100 carbides, its unique fine crystalline and smooth multi-layer structure provides process reliability and best the workpiece surfaces.



CCDia®FiberSpeed® and CCDia®MultiSpeed

for CFRP/GFRP/Ceramics

Layer thicknesses of 3 to 17 µm make CCDia®FiberSpeed® and CCDia®MultiSpeed universal and economical solutions for drilling and milling of fiber composites and ceramics. The very good adhesion gives highly reliable processes and different coating thicknesses give sharp cutting edges or maximum wear volume.



TECHNICAL DATA

Coating technology:
Diamond

Microhardness:
10,000 HV_{0,05}

Composition of the coating material:
Multilayer, sp³

Color:
Grey

Max. operating temperature:
650 °C

Available coating thicknesses:

≈ 7 µm	•	•	•
≈ 9 µm (Plus)	•	•	–
≈ 12 µm (Extra)	•	•	–

APPLICATION EXAMPLE: COST-EFFECTIVENESS COMBINED WITH A HIGHLY RELIABLE PROCESS

Material:
EDM graphite ISO-63

Tool:
Endmill

$v_c = 600 \text{ m/min}$
 $f_z = 0.06 \text{ mm/tooth}$



TECHNICAL DATA

Coating technology:
Diamond

Microhardness:
10,000 HV_{0,05}

Composition of the coating material:
Multilayer, sp³

Color:
Grey

Max. operating temperature:
650 °C

Available coating thicknesses:

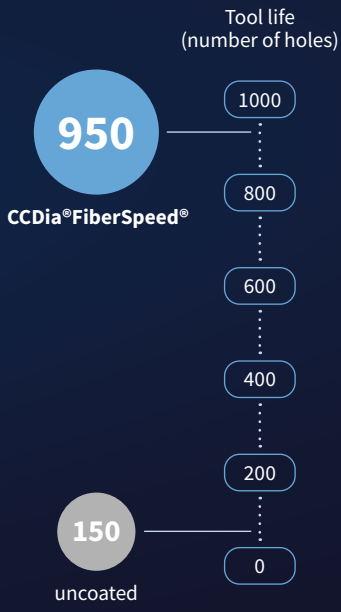
≈ 3 µm** (Thin)	•	•	–	–
≈ 9 µm*	•	•	•	•
≈ 14 µm**	•	•	•	–
≈ 17 µm** (Plus)	•	•	–	–

APPLICATION EXAMPLE: HIGH WEAR VOLUME FOR MAXIMUM PERFORMANCE

Material:
CFRP, M21E

Tool:
Solid carbide drill, ø 5.6 mm

$f_z = 0.06 \text{ mm/tooth}$
 $n = 6500 \text{ min}^{-1}$



*CCDia®FiberSpeed®, **CCDia®MultiSpeed

Application examples

Material to be machined

Diamond coatings



Crowns, inlays and bridges in the dental technology

Zirconium oxide

CCDia®CarbonSpeed®

IDI Precision Machinery Ltd.



Structural components for aircraft



Back implants

Fiber reinforced plastics (CFRP/GFRP)

CCDia®AeroSpeed®
CCDia®FiberSpeed®
CCDia®MultiSpeed



Sporting goods such as bicycle rims



Lightweight construction components for e-mobility



Graphite electrodes for the mold production of displays

Graphite

CCDia®CarbonSpeed®



Stamps and dies for forming

Carbide

CCDia®CarbideSpeed®



Lightweight components in automotive engineering

Hypereutectic aluminum

CCDia®FiberSpeed®
CCDia®MultiSpeed

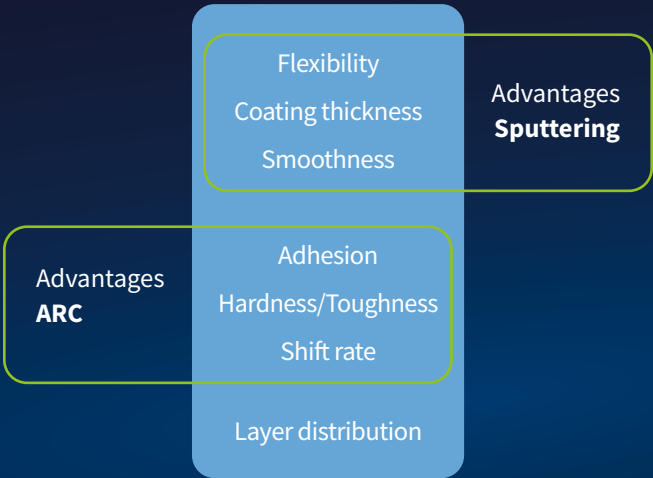


As the market leader, we offer future-proof diamond coatings to meet the challenges of the aerospace, 3-C (Computer, Communication and Consumer Electronics) industry and medical and dental technology.

HiPIMS Provides Maximum Flexibility. The Largest Range of Coating Materials and Substrates is Possible.

HiPIMS (High Power Impulse Magnetron Sputtering) combines the advantages of all coating technologies used for cutting tools. Smoothness without any droplets, high hardness, compact layer structures, and scratch loads over 130 Newton make the difference. Tools coated in this way offer excellent protection against wear in extremely hard, especially tough and oxidation-resistant materials such as stainless steel, titanium or nickel-based alloys. Of course, HiPIMS coatings also show their full performance in unalloyed, alloyed and high-speed steels. High metal ionization close to 100 % ensures the best coating adhesion, even in materials that particularly difficult to machining such as cold welds.

Advantages of HiPIMS



Learn more
about our
premium coating
materials

coatings.cemecon.com

AluCon® for Aluminum, Titanium and Non-ferrous Metals

The coating material AluCon® is a TiB₂-based HiPIMS coating material. It forms a unique combination of nanocrystalline, extremely dense and at the same time smooth coating material with maximum coating adhesion. It effectively prevents built-up edges and has a hardness of up to 5,000 HV_{0.05}. The guarantor for optimum machining results in non-ferrous metals, even at high operating temperatures.



TECHNICAL DATA

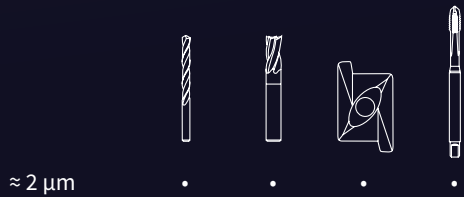
Coating technology:
HiPIMS

Composition of the coating material:
TiB₂-based

Color:
Silver

Max. operating temperature:
1,100 °C

Available coating thickness:



APPLICATION EXAMPLE: AGAINST BUILT-UP EDGES WITH MAXIMUM COATING ADHESION

Material: **TiAl6V4**

Tool:
Inserts with x-geometry

$v_c = 100 \text{ m/min}$

$f_z = 0.6 \text{ mm}$

$a_e = 15.28 \text{ mm}$

$a_p = 0.8 \text{ mm}$

$v_b = 0.34 \text{ mm}$

Cooling: **Oil**

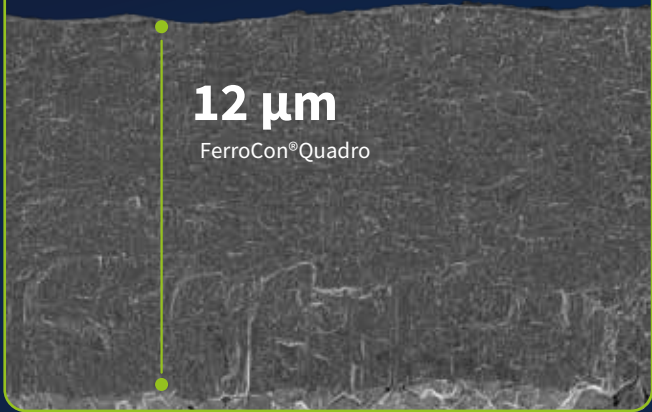


The Advantages of our HiPIMS Coatings at a Glance

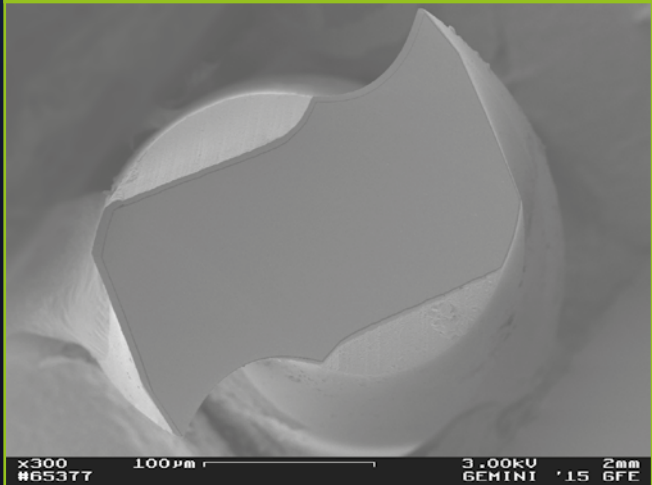
HiPIMS Coatings are the Future of PVD Technology.

Perfect for heavy duty machining

HiPIMS coatings from CemeCon, such as FerroCon®Quadro, are available in a coating thickness of up to 12 µm. Only our HiPIMS can do this!

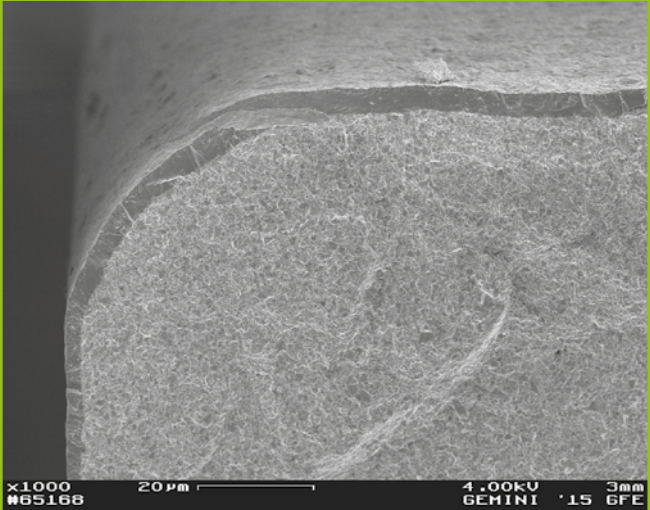


Perfect for micro tools



Defect free and without antenna effects. HiPIMS is perfect for very small geometries since there are no disturbing droplets and it does not produce damaged or rounded cutting edges.

Homogeneous coating of the cutting edges



The high level of ionization produces a denser structure and compact coatings which are at the same time very hard and tough. Using the HiPIMS technology, deposited coatings grow extremely homogeneously. Even very complex tool geometries are coated homogeneously around the cutting edge.

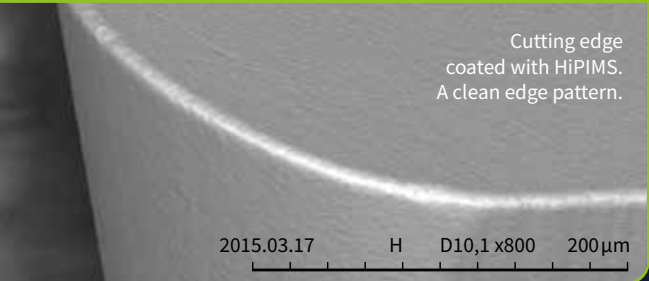
Protection against thermal overload

HiPIMS coatings have a coating structure with higher density and thereby have more favorable thermo-physical properties in machining. The heat is mainly removed by the chip which protects the substrates from thermal overload.

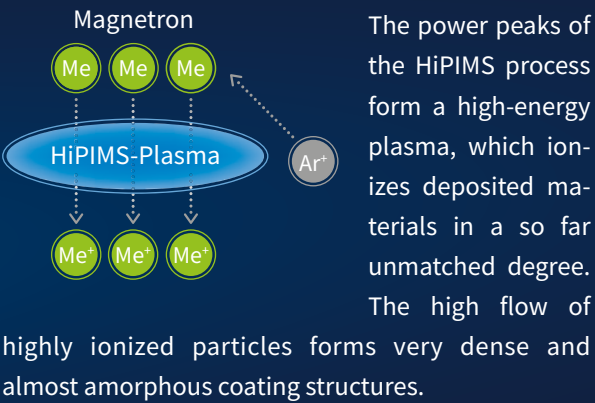
Very good residual stress management

HiPIMS reduces the residual stress in the coating radically. This enables a high range of coating thickness. In contrast, ARC coatings have to deal with high compressive stress and CVD coatings with tensile stress.

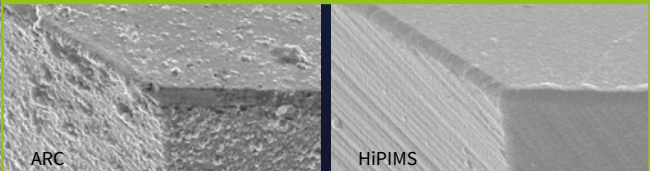
CemeCon Sputtering



Very dense and almost amorphous layer structures



Extremely smooth and droplet free



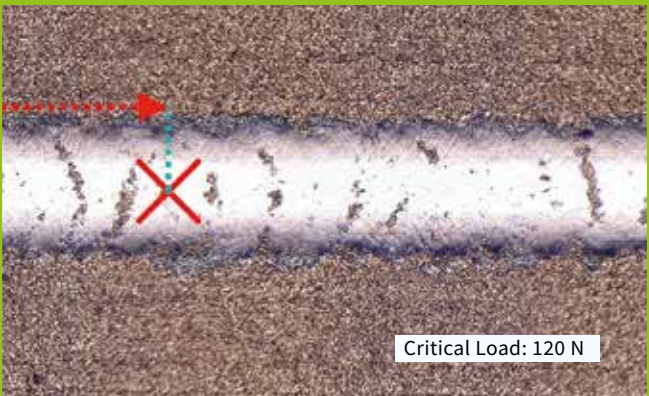
In contrast to droplets on the surface using other coating methods such as Arc, the surfaces are extremely smooth when using the HiPIMS process.

Maximum flexibility in material selection



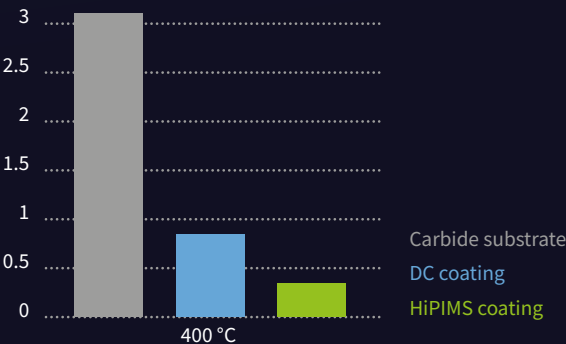
HiPIMS is a sputtering process and nearly every material can be sputtered. This means an unlimited material variety due to the combination possibilities of the elements of the periodic table for the production of coatings.

Highest adhesion



The high level of metal ionization ensures best adhesion. A scratch load of 120 Newtons for the Si-doped – and therefore very hard – InoxaCon®-coating is extraordinary. The AlTiN-based product FerroCon® achieved up to 130 Newtons. This enables the machining of the most difficult materials.

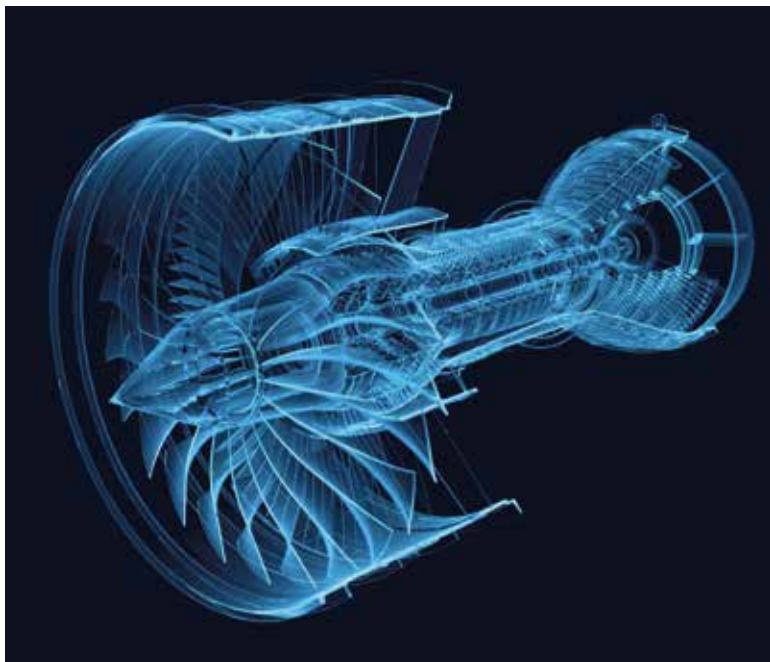
Thermal conductivity of coatings



FerroCon®

For Unalloyed, Alloyed and High-speed Steel (Ferrous Materials)

The premium HiPIMS coating for high-performance applications in unalloyed, alloyed and high-speed steel. Optimum adhesion, smoothest surfaces, high hardness values and toughness for your tool. Pure performance.



FerroCon®Quadro

for Highest Wear Volume

With FerroCon®Quadro, up to 12 µm can be realized with strong adhesion! For the processing of cast iron and steel this gives completely new possibilities. Everywhere where thick chips fall, such as for heavy machining and turning certain materials, protective coatings are vital for the tool and ensure high productivity. Very smooth and adhesive coatings are deposited using PVD coating processes. However, many applications require thicker layers, which so far have been produced exclusively by CVD. Suitable for indexable inserts with min. 40 µm edge honing.



TECHNICAL DATA

Coating technology:
HiPIMS
Composition of the coating material:
AlTiN-based
Color:
Anthracite
Max. operating temperature:
1,100 °C
Available coating thicknesses:

≈ 1.5 µm (Thin)	•	•	–
≈ 3 µm	•	•	•
≈ 4.5 µm (Plus)	•	–	–
≈ 6 µm (Plus)	–	–	•

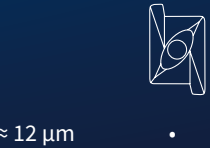
APPLICATION EXAMPLE: PERFORMANCE THANKS TO HiPIMS

Material: **40CrMoV4-6**
Tool: **Cutting insert**
 $v_c = 250 \text{ m/min}$
 $a_p = 3 \text{ mm}$
 $z = 2$



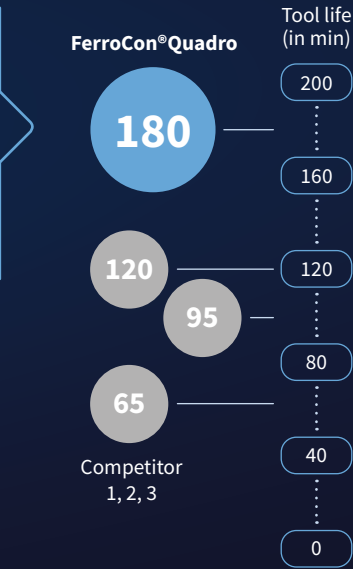
TECHNICAL DATA

Coating technology:
HiPIMS
Composition of the coating material:
AlTiN-based
Color:
Anthracite
Max. operating temperature:
1,100 °C
Available coating thickness:



APPLICATION EXAMPLE: EXTRA HIGH WEAR VOLUME FOR ROUGHING OPERATIONS IN STEEL AND CAST IRON

Material: **1.0503 (C45), 32 HRC**
Tool: **mill with cutting inserts**
 $v_c = 220 \text{ m/min}$
 $a_p = 0.5 \text{ mm}$
Without cooling



InoxaCon®

for Machining Stainless Steel, Titanium and Medium-hard Steels

Developed for machining of hardened and high alloyed steel as well as titanium. Its very high thermal stability makes the silicon-doped material InoxaCon® the first choice for your high-end tools.



TapCon®Gold

Best Performance in Thread Production for Steels/Aluminum/Cast Iron

The golden HiPIMS coating material TapCon®Gold is the first choice when it comes to the perfect coating of HSS threading tools. TapCon®Gold offers optimal adhesion to HSS, optimized wear resistance, and an extremely smooth surface which is ideal for low torque.



TECHNICAL DATA

Coating technology:
HiPIMS

Composition of the coating material:
TiAlSiN-based or at 6 µm TiAlN/TiSiN-based

Color:
Red gold

Max. operating temperature:
1,100 °C

Available coating thicknesses:

≈ 1.5 µm (Thin)	•	•	–	–
≈ 3 µm	•	•	•	•
≈ 6 µm (Plus)	–	–	–	•

APPLICATION EXAMPLE: HEAT RESISTANT AND REDUCED REWELDING

Material: **1.4301**
 Tool: **Solid carbide mill, ø 8 mm**
 $v_c = 80 \text{ m/min}$
 $f_z = 0.035 \text{ mm/tooth}$
 $a_e = 5 \text{ mm}$
 $a_p = 3 \text{ mm}$
 $z = 4$

26

InoxaCon®

97

AlCrN

Max. wear (µm)
 0
 20
 40
 60
 80
 100

TECHNICAL DATA

Coating technology:
HiPIMS

Composition of the coating material:
AlTiN-TiN-based

Color:
Gold

Max. operating temperature:
900 °C

Available coating thickness:

≈ 3 µm	•	•	•
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APPLICATION EXAMPLE: THE LAYER FOR THE PERFECT THREAD

Material: **Heat-treated steel**
 Tool: **HSS Tap M8 x 1,25**
 $v_c = 42 \text{ m/min}$

2.73

TapCon®Gold

3.37

Competitor TiN

Torque [Nm]
 2.5
 2.75
 3
 3.25
 3.5



SteelCon®

for the Machining of Hardened (≥ 50 HRC) as well as Stainless Steels

SteelCon® is the third silicon-doped HiPIMS coating material from CemeCon and enables economical machining under the extreme conditions of hard machining with first-class surface quality.

SteelCon® is highly resistant to wear. Highest temperature resistance is combined with excellent adhesion. The very homogeneous wear behavior of SteelCon® ensures high process stability. In addition to the dense layer structure, the very high silicon doping also ensures high thermal stability. Since no droplets can form thanks to the HiPIMS process, SteelCon® is also extremely smooth. The heat is dissipated in the chip, process stability increases. Excellent surface finishes are produced, eliminating the need for time-consuming reworking of components.



TECHNICAL DATA

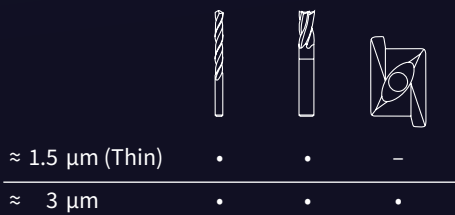
Coating technology:
HiPIMS

Composition of the coating material:
TiAlSiN-based

Color:
Red gold

Max. operating temperature:
1,100 °C

Available coating thicknesses:



APPLICATION EXAMPLE: DIE AND MOLD MAKING

Material:
1.2379: 62HRC

Tool:
**Ball nose end mill,
Ø 6 mm**

$v_c = 120 \text{ m/min}$

$n = 6366 \text{ U/min}$

$f = 0.13 \text{ mm}$

$a_p = 0.1 \text{ mm}$

$a_e = 0.1 \text{ mm}$

Cooling: **Air**



One click away!

Never before has the Decision for the Right Coating Technology been so easy!

HiPIMS (High Power Impulse Magnetron Sputtering) is sputtering with increased energy – with full control of the energy input – and combines the advantages of all current technologies. HiPIMS produces smooth, droplet-free, and low-stress coatings in an almost unlimited variety.

	ARC	CVD	HiPIMS
Surface	Droplets	Rough	Smooth
Coating temperature	500°C	1,000°C	500°C
Max. coating thickness	4 µm	10 – 15 µm	12 µm
Residual stresses of the coating	High compressive stresses	Tension	Residual stress management for low compressive stresses
Toughness of the coating	High	Low	Very high
Easy production	Yes	No (Precursor)	Yes
Flexibility	Low	None	High (all materials, all substrates)
Mini tools	No	No	Yes